

N-13 15th JSCE (Japan Society of Civil Engineering) Study Tour on the Environmental Problems in Central Vietnam (Hue and Da Nang)

○Yohei NOMURA¹, Wakana OISHI², Shuto KANEKO², Shoichi HAYASHI²,
Tetsuya KUSUDA³, Saki NISHIMURA⁴, Hina NOMURA⁵, Wenbo MA⁶,
Masashi IJIMA⁷, Ayako FUJIEDA⁸, Hidenori HARADA⁹, Shuhei TANAKA⁹,
Kazuyuki OSHITA¹⁰ and Shigeo FUJII^{9*}

¹Graduate School of Env. and Life Sci., Okayama Univ. (Tsushima-naka 3-1-1, Kita-ku, Okayama, 700-8530, Japan)

²Graduate School of Engineering, Hokkaido Univ. (Kita 13 jo Nishi 8 Chome, Kita-ku, Sapporo, 060-8628, Japan)

³Research Institute for East Asia Environments, Kyushu Univ. (744, Motooka, Nishi-ku, Fukuoka, 819-0395, Japan)

⁴School of Env. Sci. and Eng., Kochi Univ. of Technology (Tosayamada, Kami-city, Kochi, 782-8502, Japan)

⁵Dep. of Civil Eng., Kagawa National College of Tech. (355, Chokushi-cho, Takamatsu, Kagawa, 761-8058, Japan)

⁶Graduate School of Engineering, Osaka Univ. (Yamadaoka 2-1, Suita, Osaka, 565-0871, Japan)

⁷Member of Japan Society of Civil Engineers (Eifuku 3-6-10, Suginami-ku, Tokyo, 168-0064, Japan)

⁸Kyoto University Research Administration Office (Yoshida-honmachi, Sakyo-ku, Kyoto, 606-8501, Japan)

⁹Graduate School of Global Environmental Studies, Kyoto Univ. (Yoshida-honmachi, Sakyo-ku, Kyoto, 606-8501, Japan)

¹⁰Graduate School of Global Environmental Studies, Kyoto Univ. (Kyotodaigaku Katsura, Nishikyo-ku, Kyoto, 615-8540, Japan)

* E-mail: fujii.shigeo.6z@kyoto-u.ac.jp

1. INTRODUCTION

This report is about the 15th Japan Society of Civil Engineering (JSCE) Study Tour on the Environmental Problems in Central Vietnam (Hue and Da Nang). The tour was held from the 9th to the 15th of March, 2014 to understand environmental problems in developing countries and to exchange opinions among researchers, government officers, and participants, in collaboration with the Kyoto University Environmental Management Leader Program and with the Japan Society for the Promotion of Science (JSPS) Core-to-Core Program "Formulation of the cooperation hub for global environmental studies in Indochina region".

Da Nang city is a major, economically developing port city which is actively dealing with environmental problems in Vietnam. The cities of Hue and Hoi An contain World Heritage Sites, but environmental problems have been caused by urbanization. The purpose of this tour was to participate in the international workshops, to visit environmental facilities, and to interact with university students in Vietnam.

This report includes our field excursion to water purification plants in Da Nang and Hue and to the wastewater treatment plant and landfill site in Da Nang.

2. PROGRAM AND SCHEDULE

23 people (JSCE: 9 people) participated in this six-day tour. The itinerary is shown in Table 1.

Table 1. Tour itinerary.

March 10 th	Environmental facilities visit in Da Nang (Cau Do water treatment plant, Phu Loc wastewater treatment plant and Khanh Son final disposal site).
March 11 th	Workshop on the development and evaluation of water reuse technologies for the establishment of 21 st century-type water cycle systems.
March 12 th	Student workshop on the environment at the College of Sciences, Hue University, jointly organized by Collage of Sciences-Hue University, Kyoto University and Japan Society of Civil Engineering.
March 13 th	Visit to environmental facilities in Hue (Water improvement project office and Quang Te water purification plant).
March 14 th	Visit to Hue University of Agriculture and Forestry. Visit to Tam Giang-Cau lagoon. Visit to Hoi An (UNESCO World Heritage, Ancient Town)
March 15 th	Visit to Tra Que village (organic farming). Visit to My Son Sanctuary (UNESCO World Heritage, Champa Kingdom).

3. ENVIRONMENTAL FACILITIES VISIT

(1) Water treatment plant

It is very important to continuously supply water in Vietnam during the long dry season (March ~ August in the case of Da Nang). Water shortage during the dry season is a serious problem. It is also essential to maintain a high level of water quality. We visited Cau Do water treatment plant at first. The capacity is 130,000 m³/day⁽¹⁾ and the treatment processes in this plant are similar to those in Japan, and water impurities are sedimented and removed using poly aluminum chloride (PAC), a major coagulant; however, turbidity in the nearby river was high, and the water was not processed sufficiently. Also, the water coming from the nearby river contains sea water and it is difficult to reduce salinity. Since water demand increases due to the global warming and population growth, it is so important to establish the adequate treatment process considering water shortage.

On the other hand, we visited the Quang Te II water purification plant in Hue. The capacity of this plant is 55,000-65,000 m³/day⁽²⁾ which is the almost half amount of Cau Do water treatment plant. The main source of water is from Huong River⁽²⁾, but there is a growing concern about recent higher concentrations of heavy metals such as Fe and Mn owing to wastewater from industries and higher concentrations of organic compounds due to domestic wastewater discharge from residents that mainly live on boats and along rivers⁽³⁾. Therefore, it is important to implement adequate water purification treatments and also water improvement project officers is coping with the solution of water management and pollution. In this plant, treatments such as coagulation using PAC, flocculation, and filtration were performed as in Japanese treatment systems. Although water quality before treatment was in the same level as that at the Da Nang plant, the quality of treated water was greatly improved, and no odor or color was observed. This plant differed from the plant in Da Nang in its systematic monitoring and management of water quality using computers. Additionally, this plant used analytical instruments to measure water quality indices, such as chemical oxygen demand, pH and trihalomethane.

(2) Phu Loc wastewater treatment plant

Water pollution is a serious environmental problem in Vietnam, and it is essential to treat wastewater adequately. Modern activated sludge process, a major wastewater treatment in developed countries including Japan, is not widely used at large scales in Vietnam. In Da Nang, an

anaerobic lagoon system is employed because of the unstable supply of electricity; power supply is thus an issue in environmental protection. In this plant, the lagoon was covered by a black sheet, and wastewater was treated anaerobically (Picture 1).



Picture 1. Lagoon covered with black sheet.

We believe that the effluent quality is not sufficiently good, and local environmental agencies have insisted that the treatment processes should be redesigned. Recently, a research team from a Japanese university and a private company has been developing an alternative efficient wastewater treatment process: the new trickling filter process. This process could achieve better effluent quality compared with the current process with lower energy than the conventional activated sludge process. This research is useful to developing countries.

We participated in a symposium on the development and evaluation of water reuse technologies for the establishment of 21st century-type water cycle systems. Japanese and Vietnamese researchers reported water treatment results and discussed about the water management in Vietnam in the future.

(3) Khanh Son final disposal site

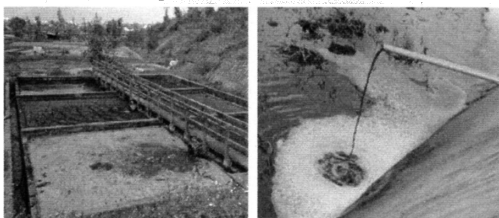
Due to rapid population growth and lifestyle changes, the amount of solid waste has been increasing in Vietnam. The rate of collected waste in 2012 was 90%, and about 250,000 ton solid waste⁽⁴⁾ has been produced and deposited directly in a landfill site without incineration in 2012 (Picture 2).



Picture 2. Direct landfill of waste.

(4) Treatment of manure from fecal sludge

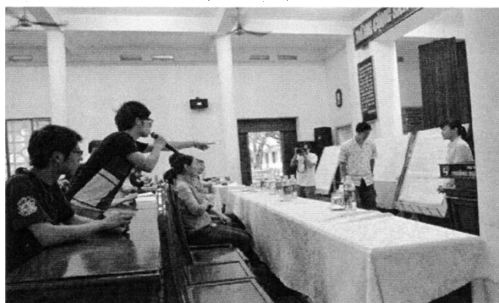
Fecal sludge from septic tanks was collected and treated separately. The treatment process consists of solid-liquid separation and anaerobic treatment. The discharged water was turbid due to inadequate treatment (Picture 3).



Picture 3. Solid-liquid separation of manure (left) and treated water (right).

(5) Student workshop at College of Sciences, Hue University

On March 12th, we visited the College of Sciences, Hue University, where a workshop on environmental issues was held. We formed four groups and discussed different themes such as water safety. After the discussion, every group presented their contents of discussion and ideas to solve the issues by using posters. Many questions and opinions enhanced the discussion (Picture 4).



Picture 4. Discussion in Hue university.

(6) Tam Giang-Cau Hai lagoon visit

Tam Giang-Cau lagoon is the largest lagoon in Southeast Asia and tropical wetland system with an area of 21,467 ha and a coastal length of 70 km². Since nutrients such as phosphorus and nitrogen come to the coastal area because of insufficient wastewater treatment, aquatic organism like shrimp grows up well. Shrimp culture is one of the main livelihoods of local communities, which total about 300,000 inhabitants⁹.

(7) Tra Que village visit

Tra Que village in Hue had a large area of farmland where

many crops like peanuts and gourds were cultivated in an organic farming manner. Since they absorb nutrients, aquatic plants have been applied as compost here to improve soil fertility and prevent eutrophication. Crops were provided to restaurants, contributing to resource circulation.

(8) My Son sanctuary visit

At last, we visited My Son sanctuary registered as World Heritage Site. A lot of historic buildings still exist and the ancient technique of the building structure of steep-slope ceiling by laying red bricks was so unique.

4. CONCLUSIONS

This tour was a great opportunity to understand the current status of and problems in Vietnam. Through the workshop and symposium, we learned that Vietnam has serious environmental problems such as water pollution. The government is working on environmental policies and human resource development.

Japanese public agencies and private companies are working on Vietnamese environmental problems, and many Vietnamese students are studying in Japan. Cooperation between developed countries and developing countries is very important for finding solutions to environmental problems. We believe that this tour enhanced cultural and technical exchanges between Japan and Vietnam.

ACKNOWLEDGEMENTS

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